

**SECTION II**  
**REMARKS**

**Regarding the Amendments**

Claims 7, 8, 9, 11, 18 and 20 have been amended as set forth in the above Complete Listing of the Claims. As amended, the claims are supported by the specification and the original claims. No new matter has been added, as defined by 35 U.S.C. § 132.

Specifically claims 7, 8 and 20 have been amended to simply correct grammatical errors in verb tense. Claims 9 and 11 have been amended to make it clear that the media substrate recited therein affirmatively comprises one or more relevant microorganisms growing thereon. Claim 18 has been amended to clarify that a single microorganism is responsible for both sulfide oxidation and nitrate reduction.

Thus, upon entry of the amendments, claims 1-20 will be pending and under examination, of which claims 1-8 are allowed.

**Allowance of Claims 1-8**

Applicants gratefully acknowledge the allowance of claims 1-8 in the Office Action mailed March 28, 2008.

**Rejection of Claims 9-17 Under 35 U.S.C. §102**

In the Office Action mailed June 28, 2008, the examiner has rejected claims 9-17 under 35 U.S.C. §102(a) as anticipated by WO 03/065798, hereinafter “Linden et al.” Applicants respectfully disagree.

Anticipation of a claim requires the disclosure in a single prior art reference of each element of the claim under consideration. (Verdegaal Bros. v. Union Oil Co. of California, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987.)

The examiner’s recitation of the elements of Linden et al. that allegedly anticipate the present invention do not include various elements claimed in the pending claims. Specifically, Linden et al. do not provide a showing of “a sludge holding tank... [comprising] a media substrate for growth of microorganisms active in sulfate reduction.” Additionally, Linden et al. do not show

“a denitrification unit... [comprising] a media substrate for growth of anaerobic microorganisms active in sulfide oxidation and nitrate reduction.” As Linden et al. do not show these elements of the claimed invention, Linden et al. cannot anticipate the claimed invention.

The examiner acknowledges on page 3 of the Office Action mailed March 28, 2008 that Linden et al. do not provide for such limitations, however the examiner alleges that “the recitations are ones of intended use that fail to add structure to the apparatus.” The examiner’s attention is respectfully drawn to the amended claims, as set forth above. The language regarding the media substrate in the sludge tank and the media substrate in the denitrification unit has been amended in claims 9 and 11 such that the media substrate has one or more relevant microorganisms growing thereon. Amendment of the claims is supported by the entirety of the specification, as the inclusion of these microorganisms is crucial to the claimed denitrification system. Clearly the presently claimed invention provides a system where sulfate reduction is performed prior to denitrification, such that the sulfide resulting from the sulfate reduction may be used as an electron donor source in the denitrification process. The reactions of sulfate reduction and denitrification are performed by microorganisms, and therefore such microorganisms must be present for the reactions to occur. As such, the specification supports amendment of the claims to include language regarding the presence of such microorganisms.

The examiner, however, further states that “[i]f it is applicant’s position that the limitations somehow add structure to the claims[, then] it is submitted that the tanks [sic] is capable of holding sludge and microorganisms active in sulfate reduction and the denitrification tank having the media for growth of anaerobic microorganisms active in sulfide oxidation.” The examiner identified tank 2a of Linden et al. as anticipatory of the sludge tank recited in claim 9 and tank 2b of Linden et al. as anticipatory of the denitrification tank recited in claim 9. Applicants respectfully disagree.

In Linden et al. the “bioreactor” identified as tank 2 is a denitrification reactor as a whole (p. 24, l. 11). Designation of compartments a, b and c of tank 2 are all “successive compartment[s] in the same biological reactor process.” (p. 23, ll.8-10; emphasis added) Therefore denitrification, or steps thereof, occur in each of 2a, 2b and 2c, as defined by Linden et al. As is clear from the “detailed description of the invention” in Linden et al., there must be an oxygen reduction process prior to the denitrification step, which is described to occur in the “oxygen consumption reactor” designated tank 1. In tank 1 oxygen consumption is promoted by “internal use of BOD or by BOD addition.” (p. 23, l. 23.) Therefore the compartment designated 2a in Linden et al. is

the site of some step of denitrification.

By contrast, the element recited in claim 9 as the sludge holding tank is

“...positioned downstream from the rearing tank and in fluid communication therewith, wherein the sludge holding tank comprises a media substrate wherein one or more microorganisms active in sulfate reduction is growing on the media substrate...”

and is not an element encompassing any step of denitrification and cannot be anticipated by element 2a of Linden et al.

Furthermore the examiner points to the language at page 8, lines 6-7 as supporting the allegation of anticipation of a sludge holding tank comprising a media substrate. The cited language “...at least one suspended carrier bioreactor for bacterial growth under anoxic conditions to cause anaerobic denitrification...” (emphasis added) does not anticipate the claimed sludge tank element. The bacteria in the sludge tank of the claimed system promote sulfate reduction, not denitrification.

Additionally, Linden et al. do not describe use of sulfide production by sulfate reduction as an electron source to promote denitrification downstream. Linden et al. do not mention the coupling of sulfate reduction and denitrification to manage waste in a recirculating marine aquaculture system.

Linden et al. do not disclose all elements of the system claimed in independent claim 9. Claims 10-17 are dependent from claim 9 and as such contain all elements of claim 9. Linden et al. therefore fail to disclose all elements of claims 10-17 as well.

As Linden et al. do not describe a marine recirculating aquaculture system as set forth in claims 9-17, Linden et al. do not anticipate the claimed invention. Accordingly, withdrawal of the rejection of claims 9-17 under 35 U.S.C. § 102(a) as being anticipated by Linden et al. is respectfully requested.

#### **Rejection of Claims 18-20 Under 35 U.S.C. §103**

In the Office Action mailed June 28, 2008, the examiner has rejected claims 18-20 under 35 U.S.C. §103(a) as anticipated by Linden et al. Applicants respectfully disagree.

To support a rejection under 35 U.S.C. §103, the prior art reference(s) must disclose all of the

limitations of the claims. MPEP § 2143.03. It is respectfully submitted that Linden et al. does not provide all limitations of the method claimed in claims 18-20. Accordingly, Linden et al. fail to provide any derivative basis for the claimed invention and no basis of *prima facie* obviousness of the claimed invention is presented by Linden et al.

Specifically, independent claim 18 recites a step of

“...reducing sulfate in the filtered salt water medium to sulfide by action of anaerobic microorganisms adapted for sulfate reduction, to yield sulfide-containing salt water medium...”

Linden et al. do not describe such a step, either implicitly or explicitly.

It is the examiner’s assertion that the language on page 19 of Linden et al. provides sufficient disclosure such that one of skill in the art would have found it obvious to “reduc[e]...the sulfates in an anaerobic zone to produce sulfides in order to, for example, facilitate removal of sulfates from the water in the form of biogas, as routine in the art.” Applicants assert that a showing of removal of sulfates from a recirculating marine aquaculture system teaches away from the claimed invention. The inclusion and use of sulfates is essential to the recited method of claims 18-20.

In considering a reference for its effect on patentability, the reference is required to be considered in its entirety, including portions of teach away from the invention under consideration. Simply stated, the prior art must be considered as a whole. *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984); MPEP § 2141.02. “It is impermissible within the framework of section 103 to pick and choose from any one reference only so much of it as will support a given position, to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one of ordinary skill in the art.” *Application of Wesslau*, 353 F.2d 238, 241 (C.C.P.A. 1965); *Bausch & Lomb, Inc. v. Barnes-Hind/Hydrocurve*, 796 F.2d 443, 448 (Fed. Cir. 1986), *cert. denied*, 484 U.S. 823 (1987).

The examiner’s attention is respectfully drawn to the language at page 15 of Linden et al. “[e]xcess salts...such as...sulphates...may be released to the environment after sterilization...” Nowhere in Linden et al. is it suggested that the sulfates might be useful in the denitrification process. The only description is how to remove the sulfates/sulfides from the system.

In *KSR International Co. v. Teleflex Inc.*, No. 04-1350, 550 U.S. \_\_\_\_ (April 30, 2007), the Supreme Court further confirmed that references that teach away from the invention are evidence

of the non-obviousness of a claimed invention, (*KSR*, slip op. at pp. 20-23) and reaffirmed the principle that a factfinder judging patentability “should be aware, of course, of the distortion caused by hindsight bias and must be cautious of arguments reliant upon *ex post* reasoning.”

Relying upon the descriptions of Linden et al., one of skill in the art would not find the method of claim 18 obvious. As claims 19 and 20 depend from 18, they contain all limitations of claim 18. Accordingly, these claims are also nonobvious in light of Linden et al.

As Linden et al. do not provide any logical basis for the method for reducing or removing nitrogenous species from a marine recirculating aquaculture system as recited in claims 18-20, Linden et al. do not render the claimed invention obvious. Accordingly, withdrawal of the rejection of claims 18-20 under 35 U.S.C. § 103 (a) as being obvious over Linden et al. is respectfully requested.

### CONCLUSION

Based on the foregoing, all of Applicants' pending claims 1-20 are patentably distinguished over the art, and are in form and condition for allowance. The Examiner is requested to favorably consider the foregoing and to responsively issue a Notice of Allowance.

The time for responding to the March 28, 2008 Office Action without extension was set at three months, or June 28, 2008. This response is therefore timely and no fees are believed to be due for the filing of this paper. However, should any fees be required or an overpayment of fees made, please debit or credit our Deposit Account No. 08-3284, as necessary.

If any issues require further resolution, the Examiner is requested to contact the undersigned attorney at (919) 419-9350 to discuss same.

Respectfully submitted,

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